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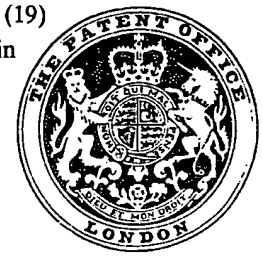

(54) ERROR CORRECTION IN ELECTRICAL METERS

(71) We, HELIOWATT WERKE ELEKTRIZITATS-GESELLSCHAFT mbH, a German company of Wilmersdorfer Strasse 39, 1000 Berlin 12, Federal Republic

Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to error correction in electrical meters.

Every measuring instrument for analog measurands can exhibit two major errors: a zero-point error and a calibration error. Other measuring errors are of a relatively minor nature as compared therewith.

According to one aspect of the present invention, there is provided a method of correcting automatically zero-point and calibration errors in an electrical meter, comprising applying to the meter at intervals a zero input signal and a reference input signal, automatically computing and storing correction values representing any deviation between the actual measured value and the desired measured value of each of the zero and reference input signals, and automatically employing the stored correction values in subsequent measurements to correct for any zero-point and calibration errors.

According to another aspect of the present invention, there is provided an electrical meter comprising means for applying to the meter at intervals a zero input signal and a reference input signal, means for computing and storing correction values representing any deviation between the actual measured value and the desired measured value of each of the zero and reference input signals, and means for employing the stored correction values in subsequent measurements to correct for any zero point and calibration errors in the meter.

In an electronic kilowatt hour meter which is one example of the invention, a zero potential signal and a reference quantity signal are applied at sufficient intervals of time to the voltage and current inputs of the meter. The input of the meter, which processes analog input signals, is provided with a preferably electronic change-over switch, which first connects the input of the meter to the zero potential signal. The result of the actual measurement is checked, and if it differs from the desired zero value measurement, a correction value is computed and stored, which cancels out the zero-point deviation. In the next step, the input is connected to the reference quantity signal. The result of the actual measurement is again tested to ascertain whether it agrees with the desired value and in the event of deviations, a correction value is again computed and stored, which cancels out the calibration error concerned. Thus, the stored correction values are employed in subsequent measurements of unknown quantities, to correct for any zero-point or calibration error. The electronic change-over switch changes over between normal input signals to the meter and the zero and reference input signals, at preferably regular intervals.

The initial and end points of the transmission characteristic curve of the meter are fixed. Consequently, the only remaining error is the curvature or the non-linearity of the transmission curve. The zero-point and calibration correction is automatically performed, not necessarily before each measurement, but only at sufficiently short intervals of time to compensate for any variations which may have meanwhile occurred in the components of the meter. In the practical performance of the zero-point and calibration correction, the correction quantitites may be stored in analog form. In the case of measuring instruments which convert analog quantities into digital values, in which kilowatt-hour meters are also

included, the correction may with advantage be carried out solely on a digital basis.

If desired, the meter may be arranged to receive a plurality of reference signals, instead of just one, and to compute and store respective correction values for each reference signal, which correction values are then employed in correcting for any calibration errors which may appear.

We have found that in an example of a meter in accordance with the invention, the method of automatic zero-point and calibration correction can substantially eliminate the effects of tolerances and drift of all the component parts of the meter. Consequently, we have found it possible to reduce the expenditure of labour in the manufacture and testing of an electronic kilowatt-hour meter, substantially eliminating the aforesaid two errors over the whole lifetime of the instrument, and thereby enhancing the measuring accuracy of the meter.

WHAT WE CLAIM IS:

1. A method of correcting automatically zero-point and calibration errors in an electrical meter, comprising applying to the meter at intervals a zero input signal and a reference input signal, automatically computing and storing correction values representing any deviation between the actual measured value and the desired measured value of each of the zero and reference input signals, and automatically employing the stored correction values in subsequent measurements to correct for any zero-point and calibration errors.

2. A method according to claim 1, wherein the zero and reference input signals are applied to the meter by an electronic switch which changes over between normal input signals to the meter and the zero and reference input signals.

3. A method according to claim 1 or 2, wherein the meter is an electronic kilowatt-hour meter.

4. A method according to claim 1, 2 or 3, wherein the meter includes means for applying the zero and reference signals to the meter at regular intervals.

5. A method according to claim 1, 2, 3 or 4, including applying a plurality of reference signals to the meter, computing and storing respective correction values therefor, and employing the stored said respective correction values in correcting for any calibration errors.

6. A method of correcting automatically zero-point and calibration errors in an electrical meter, the method being substantially as described herein.

7. An electrical meter comprising means for applying to the meter at intervals a zero input signal and a reference input signal, means for computing and storing correction values representing any deviation between the actual measured value and the desired measured value of each of the zero and reference input signals, and means for employing the stored correction values in subsequent measurements to correct for any zero-point and calibration errors in the meter.

8. A meter according to claim 7, wherein the means for applying the zero and reference input signals to the meter comprises an electronic switch which changes over between normal input signals to the meter and the zero and reference input signals.

9. A meter according to claim 7 or 8, being an electronic kilowatt-hour meter.

10. A meter according to claim 7, 8 or 9, wherein said intervals are regular intervals.

11. A meter according to claim 7, 8, 9 or 10, arranged to receive a plurality of reference signals at said intervals, to compute and store respective correction values therefor, and to employ the stored said respective correction values in correcting for any calibration errors.

12. An electrical meter substantially as described herein.

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